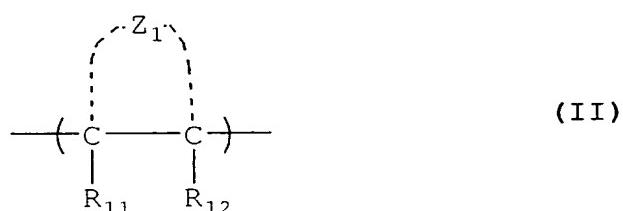


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WHAT IS CLAIMED IS:

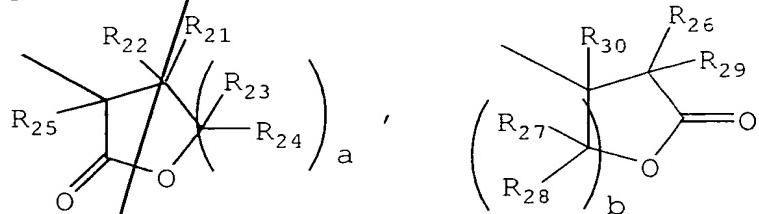
1. A positive photoresist composition for far ultraviolet exposure, comprising:
- (A) a compound capable of generating an acid by the irradiation of an actinic ray or radiation,
- (B) a polymer having at least either a repeating unit represented by the following formula (Ia) or a repeating unit represented by the following formula (Ib) and a repeating unit represented by the following formula (II) and having a group capable of decomposing by the action of an acid, and
- (C) a compound capable of decomposing by the action of an acid to generate a sulfonic acid:



wherein

in formula (Ia),  $R_1$  and  $R_2$  each independently represents hydrogen atom, a cyano group, a hydroxyl group,  $-COOH$ ,  $-COOR_5$ ,  $-CO-NH-R_6$ ,  $-CO-NH-SO_2-R_6$  (wherein  $R_5$  represents an alkyl group which may have a substituent, a cyclic hydrocarbon group which may have a substituent or a  $-Y$  group shown below, and  $R_6$  represents an alkyl group which may have a substituent or a cyclic hydrocarbon group which may have a substituent), an alkyl group which may be substituted, an alkoxy group which may be substituted, a cyclic hydrocarbon group which may be substituted or a  $-Y$  group shown below,  $X$  represents oxygen atom, sulfur atom,  $-NH-$ ,  $-NHSO_2-$  or  $-NHSO_2NH-$ , and  $A$  represents a single bond or a divalent linking group:

$-Y$  group:



(wherein  $R_{21}$  to  $R_{30}$  each independently represents hydrogen atom or an alkyl group which may have a substituent, and  $a$  and  $b$  each represents 1 or 2);

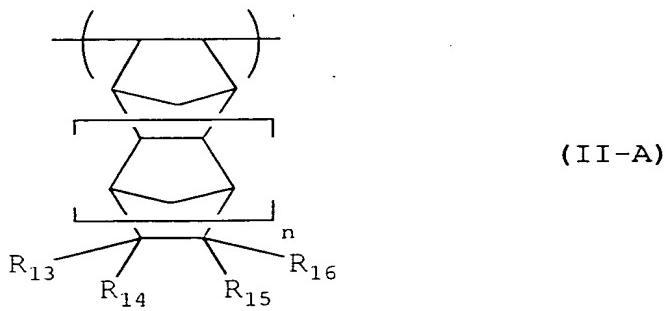
in formula (Ib),  $Z_2$  represents  $-O-$  or  $-N(R_3)-$  (wherein  $R_3$  represents hydrogen atom, a hydroxyl group or  $-OSO_2-R_4$  (wherein  $R_4$  represents an alkyl group, a haloalkyl group, a

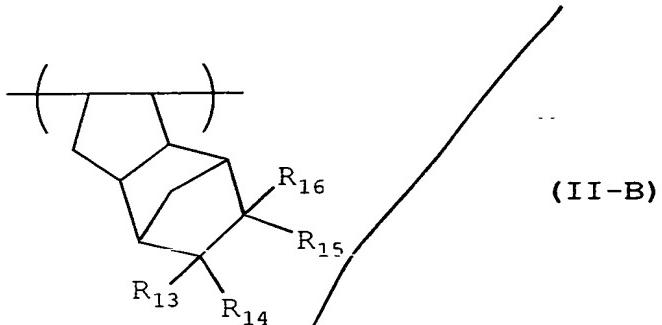
cycloalkyl group or a camphor residue); and

in formula (II),  $R_{11}$  and  $R_{12}$  each independently represents hydrogen atom, a cyano group, a halogen atom or an alkyl group which may have a substituent, and  $Z_1$  represents an atomic group necessary for forming an alicyclic structure which contains two bonded carbon atoms (C-C) and may have a substituent.

2. The positive photoresist composition for far ultraviolet exposure as claimed in claim 1, wherein  $Z_1$  in formula (II) represents an atomic group necessary for forming a bridged alicyclic structure which contains two bonded carbon atoms (C-C) and may have a substituent.

3. The positive photoresist composition for far ultraviolet exposure as claimed in claim 1, wherein the repeating unit represented by formula (II) is that represented by the following formula (II-A) or (II-B):





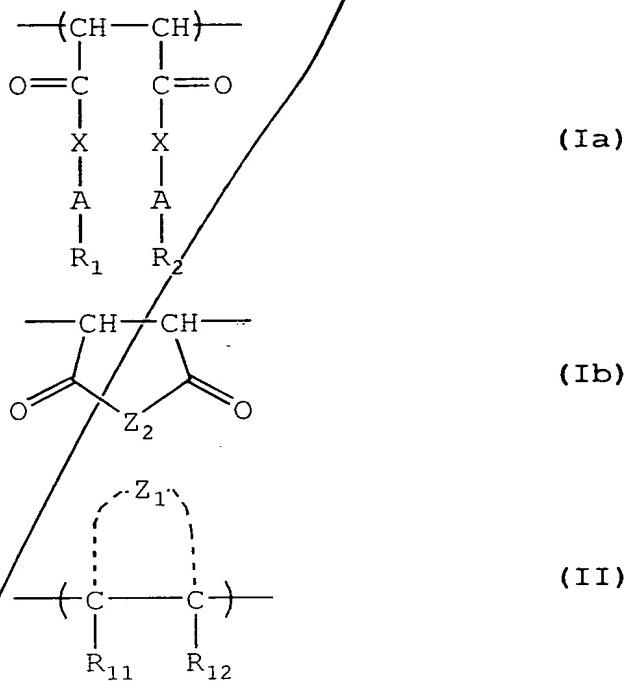
wherein R<sub>13</sub> to R<sub>16</sub> each independently represents hydrogen atom, a halogen atom, a cyano group, -COOH, -COOR<sub>5</sub> (wherein R<sub>5</sub> is the same as defined above), a group capable of decomposing by the action of an acid, -C(=O)-X-A-R<sub>17</sub> (wherein X and A are the same as defined above, and R<sub>17</sub> represents -COOH, -COOR<sub>5</sub>, -CN, a hydroxyl group, an alkoxy group which may have a substituent, -CO-NH-R<sub>6</sub>, -CO-NH-SO<sub>2</sub>-R<sub>6</sub> (wherein R<sub>5</sub> and R<sub>6</sub> are the same as defined above) or a -Y group shown above), an alkyl group which may have a substituent or a cyclic hydrocarbon group which may have a substituent, at least two of R<sub>13</sub> to R<sub>16</sub> may be combined to form a ring, and n represents 0 or 1.

4. A positive photoresist composition for far ultraviolet exposure, comprising:

- (A) a compound capable of generating an acid by the irradiation of an actinic ray or radiation,
- (B) a polymer having at least either a repeating unit represented by the following formula (Ia) or a repeating unit represented by the following formula (Ib) and a repeating unit represented by the following formula (II)

and having a group capable of decomposing by the action of an acid, and

(D) a fluorine-type and/or silicon-type surface active agent:

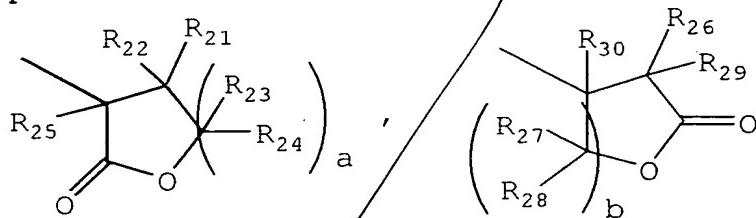


wherein

in formula (Ia),  $\text{R}_1$  and  $\text{R}_2$  each independently represents hydrogen atom, a cyano group, a hydroxyl group,  $-\text{COOH}$ ,  $-\text{COOR}_5$ ,  $-\text{CO-NH-R}_6$ ,  $-\text{CO-NH-SO}_2-\text{R}_6$  (wherein  $\text{R}_5$  represents an alkyl group which may have a substituent, a cyclic hydrocarbon group which may have a substituent or a  $-\text{Y}$  group shown below, and  $\text{R}_6$  represents an alkyl group which may have a substituent or a cyclic hydrocarbon group which may have a substituent), an alkyl group which may be

substituted, an alkoxy group which may be substituted, a cyclic hydrocarbon group which may be substituted or a -Y group shown below, X represents oxygen atom, sulfur atom, -NH-, -NHSO<sub>2</sub>- or -NHSO<sub>2</sub>NH-, and A represents a single bond or a divalent linking group:

-Y group:



(wherein R<sub>21</sub> to R<sub>30</sub> each independently represents hydrogen atom or an alkyl group which may have a substituent, and a and b each represents 1 or 2);

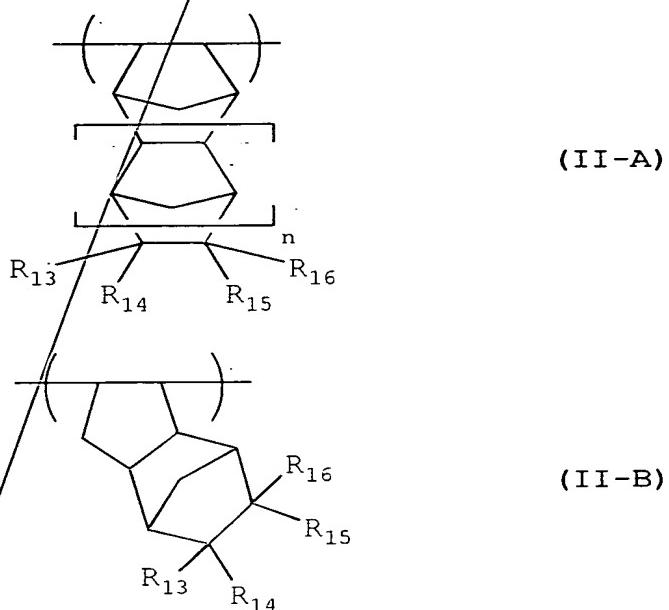
in formula (Ib), Z<sub>2</sub> represents -O- or -N(R<sub>3</sub>)- (wherein R<sub>3</sub> represents hydrogen atom, a hydroxyl group or -OSO<sub>2</sub>-R<sub>4</sub> (wherein R<sub>4</sub> represents an alkyl group, a haloalkyl group, a cycloalkyl group or a camphor residue)); and

in formula (II), R<sub>11</sub> and R<sub>12</sub> each independently represents hydrogen atom, a cyano group, a halogen atom or an alkyl group which may have a substituent, and Z<sub>1</sub> represents an atomic group necessary for forming an alicyclic structure which contains two bonded carbon atoms (C-C) and may have a substituent.

5. The positive photoresist composition for far ultraviolet exposure as claimed in claim 4, wherein Z<sub>1</sub> in

formula (II) represents an atomic group necessary for forming a bridged alicyclic structure which contains two bonded carbon atoms (C-C) and may have a substituent.

6. The positive photoresist composition for far ultraviolet exposure as claimed in claim 4, wherein the repeating unit represented by formula (II) is that represented by the following formula (II-A) or (II-B):



wherein R<sub>13</sub> to R<sub>16</sub> each independently represents hydrogen atom, a halogen atom, a cyano group, -COOH, -COOR<sub>5</sub> (wherein R<sub>5</sub> is the same as defined above), a group capable of decomposing by the action of an acid, -C(=O)-X-A-R<sub>17</sub> (wherein X and A are the same as defined above, and R<sub>17</sub> represents -COOH, -COOR<sub>5</sub>, -CN, a hydroxyl group, an alkoxy group which may have a substituent, -CO-NH-R<sub>6</sub>, -CO-NH-SO<sub>2</sub>-R<sub>6</sub>

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(wherein R<sub>5</sub> and R<sub>6</sub> are the same as defined above) or a -Y group shown above), an alkyl group which may have a substituent or a cyclic hydrocarbon group which may have a substituent, at least two of R<sub>13</sub> to R<sub>16</sub> may be combined to form a ring, and n represents 0 or 1.

7. The positive photoresist composition for far ultraviolet exposure as claimed in claim 4, which contains a nitrogen-containing basic compound.

8. The positive photoresist composition for far ultraviolet exposure as claimed in claim 7, wherein the nitrogen containing basic compound is at least one compound selected from the group consisting of 1,5-diazabicyclo[4.3.0]-5-none, 1,8-diazabicyclo[5.4.0]-7-undecene, 1,4-diazabicyclo[2.2.2]octane, 4-dimethylaminopyridine, hexamethylenetetramine, 4,4-dimethylimidazoline, pyrroles, pyrazoles, imidazoles, pyridazines, pyrimidines, tertiary morpholines and hindered amines having a hindered piperidine skeleton.

9. A positive photoresist composition for far ultraviolet exposure, comprising:

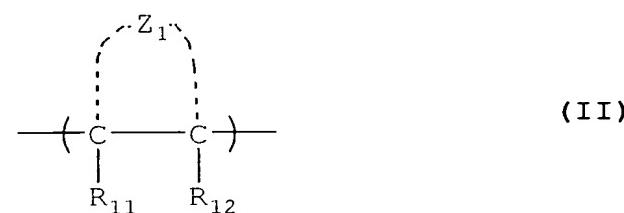
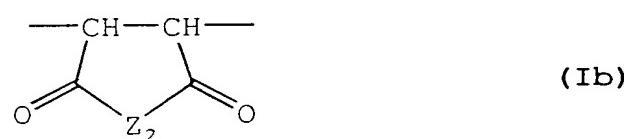
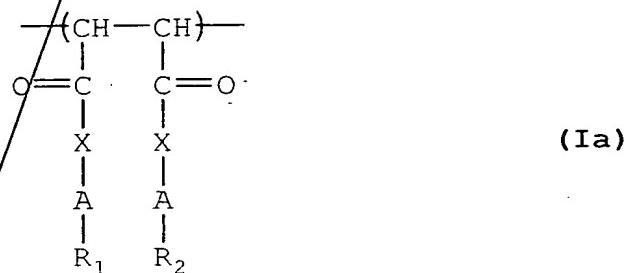
(A) a compound capable of generating an acid by the irradiation of an actinic ray or radiation,

(B) a polymer having at least either a repeating unit represented by the following formula (Ia) or a repeating unit represented by the following formula (Ib) and a

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repeating unit represented by the following formula (II) and having a group capable of decomposing by the action of an acid, and

(E) a mixed solvent containing at least one selected from the group consisting of butyl acetate and propylene glycol monoalkyl ether carboxylate and at least one selected from the group consisting of ethyl lactate and propylene glycol monoalkyl ether:



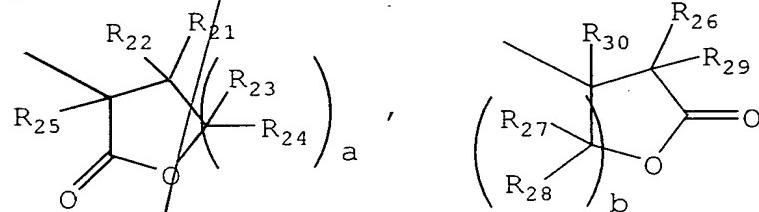
wherein

in formula (Ia),  $\text{R}_1$  and  $\text{R}_2$  each independently represents hydrogen atom, a cyano group, a hydroxyl group,  $-\text{COOH}$ ,  $-\text{COOR}_5$ ,  $-\text{CO-NH-R}_6$ ,  $-\text{CO-NH-SO}_2\text{-R}_6$  (wherein  $\text{R}_5$  represents an alkyl group which may have a substituent, a

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cyclic hydrocarbon group which may have a substituent or a -Y group shown below, and R<sub>6</sub> represents an alkyl group which may have a substituent or a cyclic hydrocarbon group which may have a substituent), an alkyl group which may be substituted, an alkoxy group which may be substituted, a cyclic hydrocarbon group which may be substituted or a -Y group shown below, X represents oxygen atom, sulfur atom, -NH-, -NHSO<sub>2</sub>- or -NHSO<sub>2</sub>NH-, and A represents a single bond or a divalent linking group:

-Y group:



(wherein R<sub>21</sub> to R<sub>30</sub> each independently represents hydrogen atom or an alkyl group which may have a substituent, and a and b each represents 1 or 2);

in formula (Ib), Z<sub>2</sub> represents -O- or -N(R<sub>3</sub>)- (wherein R<sub>3</sub> represents hydrogen atom, a hydroxyl group or -OSO<sub>2</sub>-R<sub>4</sub> (wherein R<sub>4</sub> represents an alkyl group, a haloalkyl group, a cycloalkyl group or a camphor residue)); and

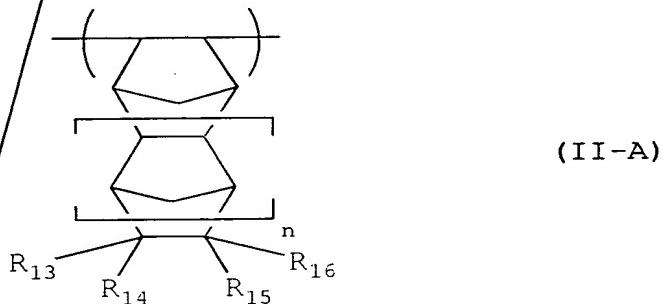
in formula (II), R<sub>11</sub> and R<sub>12</sub> each independently represents hydrogen atom, a cyano group, a halogen atom or an alkyl group which may have a substituent, and Z<sub>1</sub> represents an atomic group necessary for forming an

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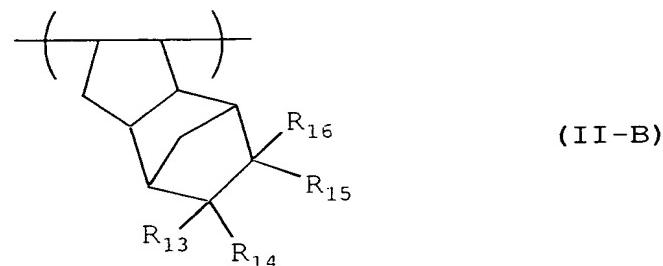
alicyclic structure which contains the two bonded carbon atoms (C-C) and may have a substituent.

10. The positive photoresist composition for far ultraviolet exposure as claimed in claim 9, wherein Z<sub>1</sub> in formula (II) represents an atomic group necessary for forming a bridged alicyclic structure which contains two bonded carbon atoms (C-C) and may have a substituent.

11. The positive photoresist composition for far ultraviolet exposure as claimed in claim 9, wherein the repeating unit represented by formula (II) is that represented by the following formula (II-A) or (II-B):



(II-A)



(II-B)

wherein R<sub>13</sub> to R<sub>16</sub> each independently represents hydrogen atom, a halogen atom, a cyano group, -COOH, -COOR<sub>5</sub> (wherein R<sub>5</sub> is the same as defined above), a group capable of

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decomposing by the action of an acid,  $-C(=O)-X-A-R_{17}$  (wherein X and A are the same as defined above, and  $R_{17}$  represents  $-COOH$ ,  $-COOR_5$ ,  $-CN$ , a hydroxyl group, an alkoxy group which may have a substituent,  $-CO-NH-R_6$ ,  $-CO-NH-SO_2-R_6$  (wherein  $R_5$  and  $R_6$  are the same as defined above) or a  $-Y$  group shown above), an alkyl group which may have a substituent or a cyclic hydrocarbon group which may have a substituent, at least two of  $R_{13}$  to  $R_{16}$  may be combined to form a ring, and n represents 0 or 1.

12. The positive photoresist composition for far ultraviolet exposure as claimed in claim 9, which contains a nitrogen-containing basic compound.

13. The positive photoresist composition for far ultraviolet exposure as claimed in claim 12, wherein the nitrogen containing basic compound is at least one compound selected from the group consisting of 1,5-diazabicyclo[4.3.0]-5-none, 1,8-diazabicyclo[5.4.0]-7-undecene, 1,4-diazabicyclo[2.2.2]octane, 4-dimethylamino-pyridine, hexamethylenetetramine, 4,4-dimethylimidazoline, pyrroles, pyrazoles, imidazoles, pyridazines, pyrimidines, tertiary morpholines and hindered amines having a hindered piperidine skeleton.

14. The positive photoresist composition as claimed in claim 9, wherein the mixed solvent (E) additionally contains at least one solvent selected from the group

consisting of  $\gamma$ -butyrolactone, ethylene carbonate and propylene carbonate.